NATURAL SCIENCES OLYMPIAD – 2021

GRADES 4 – 6

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1. Animals with a constant body temperature are …

A. Birds and Mammals
(These warm-blooded animals must maintain a constant internal temperature, irrespective of the outside temperature to survive)

2. What causes solids, liquids and gases to change phase?

A. Heating and cooling
(A phase change only happens when matter is either heated or cooled)

3. Producers, consumers and decomposers are dependent on each other for their……

D. survival
(e,g Producers do not need consumers in order to breath or grow, and do not need decomposers to reproduce.)

4. The Earth's Lithosphere consists of …

B. rock, soil and minerals. (All of these components can be found in the Earth's crust and upper mantle, which form part of the Lithosphere)

5. Which one of the following is NOT a life process?

B. Thinking
(The seven life processes include: movement, reproduction, sensitivity, nutrition, excretion, respiration, growth.)

6. Which of the following can be found in the habitat of a living organism?

A. Food.
B. Shelter.
C. A place to hide from danger.
D. All of the above

7. Which one of the following statements is correct about phases of matter?

A. Solids keep their shape.
B. Liquids can flow and is able to take up the shape of a container.
C. Gases, such as air, tend to spread out, have no definite shape and the particles have complete freedom of motion.
D. All of the above statements are correct.

8. Identify which one of the following organisms supplies energy to more than one organism in the food web.

B. Mouse
(The mouse can be consumed by the snake and the hawk. A mouse thus provide food (chemical energy) to snakes and hawks.

9. Which one of the following statements is NOT true about the Sun?

B. The Sun is made up of very hot, molten rock. (The Sun is made of up of different gasses)

10. Which one of the following statements dealing with energy is incorrect?

D. People can create energy. (energy cannot be created or destroyed, it can only be transformed from one form into another.)

11. Plants need … to grow.

A. light, water and air (Not all plants need warmth and, or soil to grow in.)

12. Which one of the following statements is NOT true?

D. All animals need a habitat as a place where they can hunt.
(Some animals are herbivores and do not need to hunt.)

13. Choose the medium through which sound will travel the fastest.

D. cold steel
(The higher the density of a medium, the faster sound travels through the medium. Steel has the highest density of all the materials listed))

14. Choose the correct statement:

C. Sound produced by a drum has lower pitch than the sound produced by a whistle.

15. Arrange the following bodies in order from smallest to largest.

Sun	Earth	Moon	Continent

A. Continent, Moon, Earth, Sun

16. The fruits shown below can be divided into two categories based on their basic structure:

Which of the following two categories represent a correct division?

B. Category 1: pawpaw, peach and avocado
Category 2: banana, strawberry and pineapple

17. Consider the scales (mass meters) below and determine by how much the mass measured by scale X differs from the mass measured by scale Y

Scale X Scale Y

B. The difference in mass measured by scale X and Y is 40kg.
(115kg on Scale X – 155kg on scale Y=40kg)

18. Consider the following energy sources and pick the odd one out.

Bread	Sunlight	Gas used for cooking	Diesel

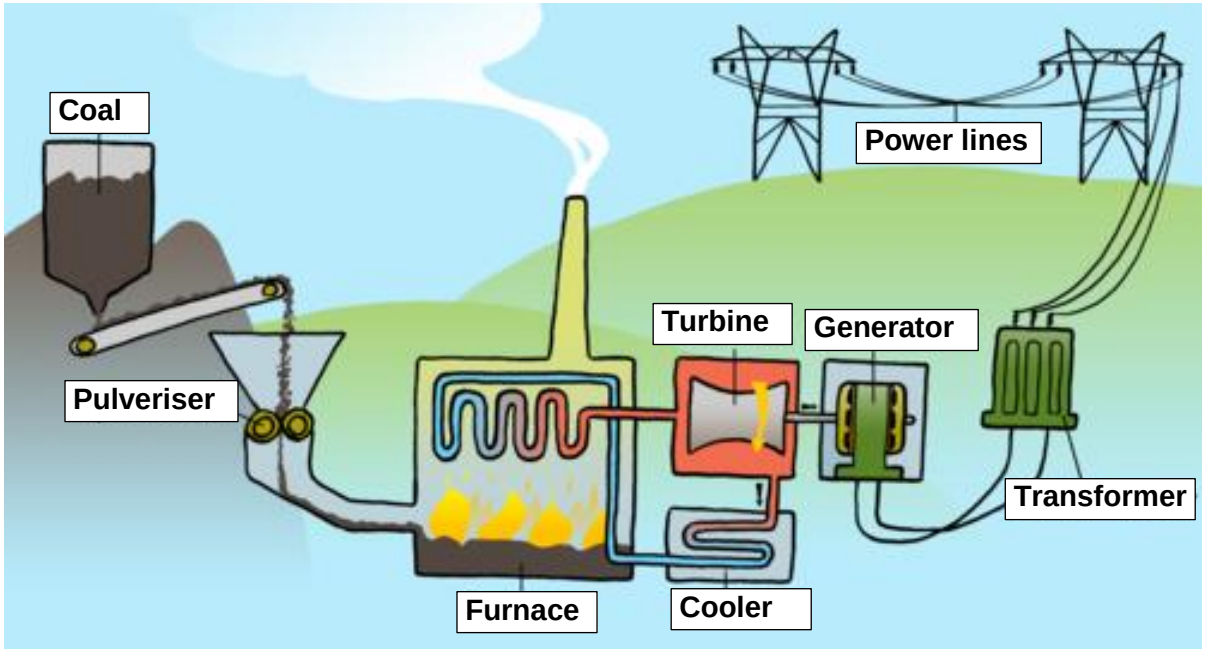
B. Sunlight

(Bread, cooking gas and diesel can store chemical energy. Sunlight is not an example of chemical potential energy)

19. Which one of the following substances can rust?

C. Iron (All other mentioned materials cannot rust.)

20. Which power station in South Africa does not make use the source of energy shown in the diagram below?



B. Koeberg

21. Which type of soil contains a fair amount of decomposed matter?

C. Loamy soil

22. Which type of soil can retain the greatest amount of water?

B. Clay (Clay particles are very small and have a high water retention capacity)

23. What do plants need to produce their own food?

D. Energy from the sun, carbon dioxide and water.

24. Which one of the following food chains correctly indicates the flow of energy in an ecosystem?

C. Grass → Goat → Human (Producer → Herbivore → Omnivore)

25. Identify two requirements for fuel (diesel or petrol) to combust(burn) inside motor car engines.

C. Heat and oxygen

26. Which one of the following statements is correct regarding fossils?

C. Body fossils are formed from the hard parts of plants and animals, while trace fossils are formed from traces (e.g. footprints) left behind by animals.

27. Which one of the following statements is false (NOT correct)?

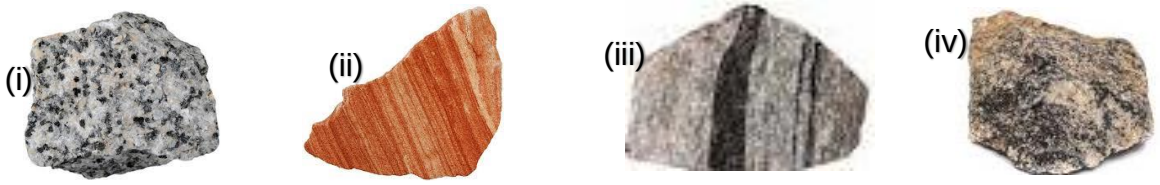
C. Bone is dry and a non-living supporting structure. (The bones in our body are living tissue. They have their own blood vessels and are made of living cells)

28. Which of the following properties of aluminium make it suitable for the manufacturing of cooking utensils such as pots and pans?

(i) Good thermal conductivity
(ii) Good electrical conductivity
(iii) Ductility
(iv) High melting point

D. (i) and (iv)
(The maximum amount of heat needs to be conducted to the food and the utensils should not melt at high temperatures.)

29. Consider the rock types shown in die diagram. Which of these rocks are most likely sedimentary rocks?

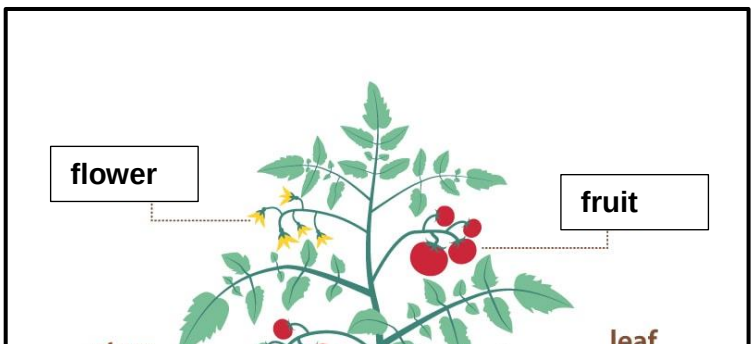


B. (ii) and (iii) are sedimentary rocks (Both examples are visibly layered.)

30. Which one of the following statements gives a correct comparison of mains electricity and direct current electricity?

B. Mains electricity is made available to a household by means of a wall socket while direct current electricity is produced by an electrical cell or battery.

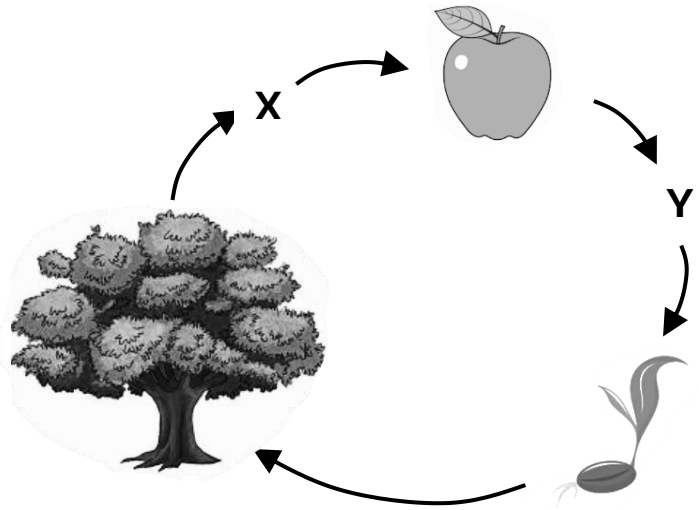
31. Consider the diagram of a plant below. Identify which part of the plant is primarily responsible for making food for the plant.



stem	**leaf**
roots	

D. Leaf (A leave is where photosynthesis “the food making process” takes place.)

32. The picture below shows a life cycle of an apple tree. Identify what X and Y represent.



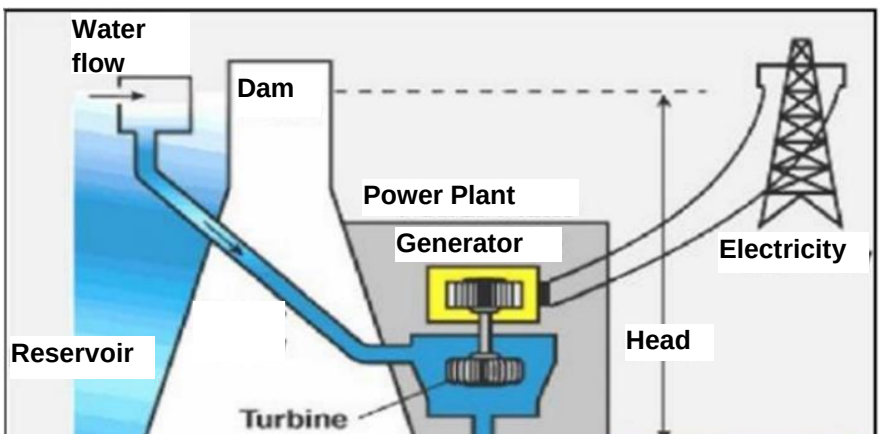
D. X represents a flower and Y represents a seed.

33. Select a mineral which is NOT a metal from the list below.

Copper	Silver	Gold	Diamond

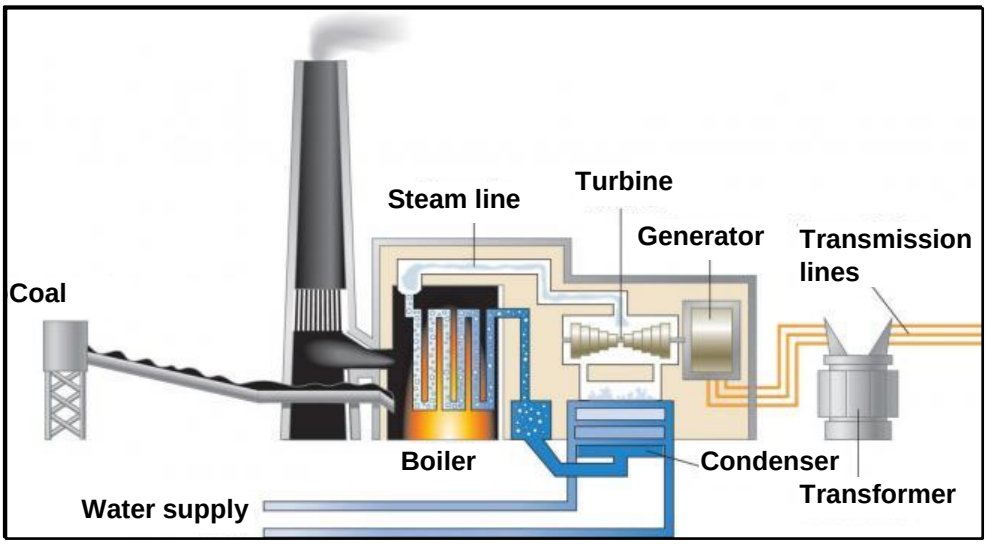
B. Diamond (Diamonds consist of carbon which is a non-metal)

34. What type of electric current is supplied by the two power stations in the diagrams below?



Power station X

Turbine



Power station Y

A. Power station X and Y supply the same type of electric current.
(Both X and Y supply alternating electrical current.)

35. Choose the correct statement.

C. It takes the Earth 365 days to revolve around the Sun.

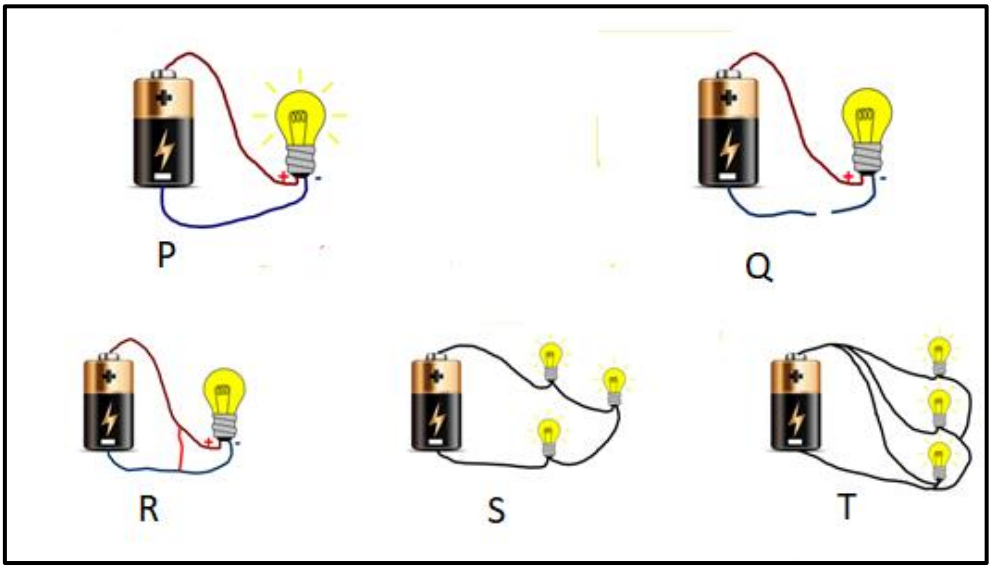
36. Which one of the following statements best describes what happens during the process of photosynthesis?

A. Sugar is formed and oxygen is released during the process of photosynthesis.

37. Which combination of terms are correct when considering a mixture of sugar and distilled water.

D. Sugar is the solute, water is the solvent and the mixture of sugar and water is the solution.

38. Consider the circuit diagrams shown below. In which circuit will the electric current flow but the bulb(s) will not produce light



C. Circuit R (A connecting wire between the top and bottom wires are responsible for a Short Circuit. The current therefore does not pass through the bulb)

39. Which one of the following statements about the movement of the Earth is correct?

B One Earth-rotation takes about 24 hours while one revolution of the Earth about the Sun takes about a year.

40. Vitamins, minerals and proteins are supplied to your body when suitable amounts of … are included in your diet.

B. fatty fish

41. A diet containing the correct amount of carbohydrates, proteins, fats, fibre, vitamins, minerals and water needed to fulfil the bodies energy requirements is called a …

B balanced diet

42. Which one of the following diseases is not related to a poor diet?

D. Bilharzia

43. The state of matter which is sometimes invisible has …

C. particles that are far apart from each other with particles moving in all directions. (Referring to a Gas)

44. A solution may contain …

A. only one solvent but many solutes.

45. Which one of the following is NOT in general considered a function of a wetland.

D Controls the spreading of invasive plant species. (Wetlands are fertile areas, where most plant species can thrive, including invasive species.)

46. Energy …. in an Ecosystem.

C. flows
(Energy flows from the sun to the producer from the producer to the consumer from the consumer to the decomposer)

47. The main source of energy in an ecosystem is …

A. the Sun. (The Sun is the major source of energy for organisms and the ecosystems of which they are a part. Producers such as plants, algae, and cyanobacteria use the energy from sunlight to make organic matter from carbon dioxide and water. This establishes the beginning of energy flow through almost all food webs.)

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48. Consider the the diagram of a pond ecosystem.

Fish
(Consumers)

Algae
(Producers)

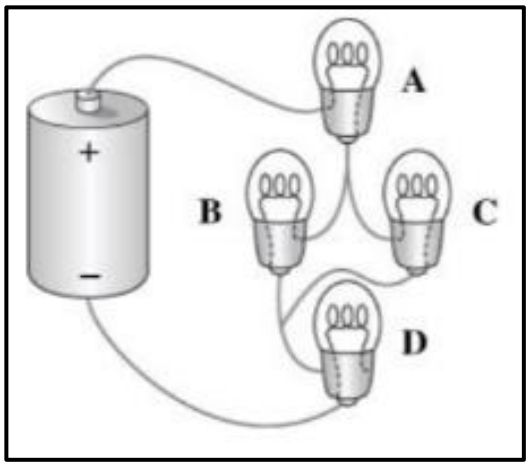
Insect
(Consumers)

Bacteria
(Decomposer)

Which one of the following relationships is correct when analising the information in the diagram?

B. Water offers the fish a suitable habitat.

49. Four similar bulbs are connected in an electrical circuit as indicated in the diagram.



Which one of the following statements is TRUE when considering the brightness of bulbs A,B,C and D?

C. Bulb A and D burns with the same brightness, but burns more brightly than bulbs B and C. (The same(total) current flows through A and D while a portion of the total current is divided passing through B and C)

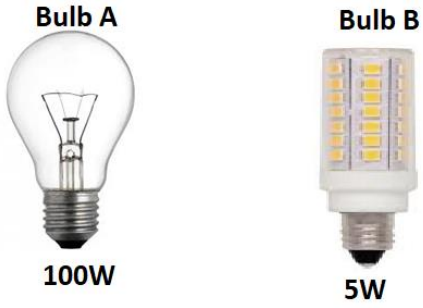
50. Identify the correct statement by comparing the gases used and released by plants and animals.

B. Plants use carbon dioxide and release oxygen during photosynthesis while animals use oxygen and release carbon dioxide during respiration.

51. Consider the following food group wheel. Choose the correct statement about the function of the nutrients in each food group.

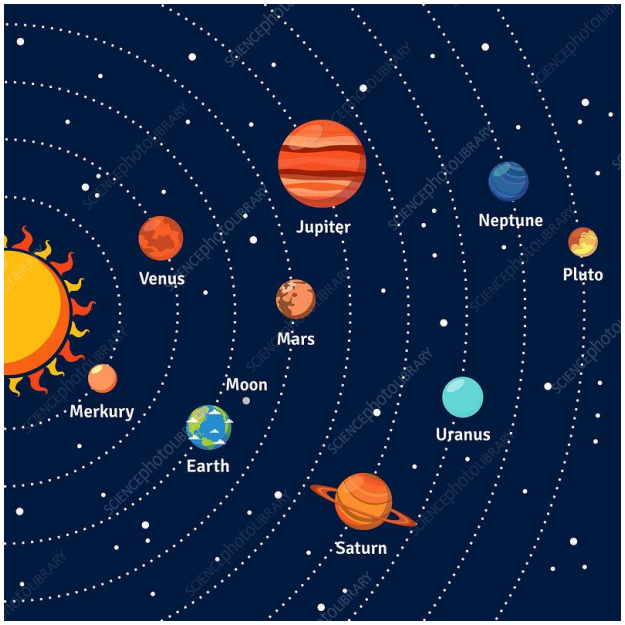
B. The food group B contains nutrients which are important for storing energy and providing protection for nerves. (Group B contains proteins rich food)

52. Compare the monthly cost of using bulb A with that of using bulb B, both for a period of 120 hours per month at a cost of R1,30 per kWh.



C. Monthly cost of using bulb A is R15.60 and that of bulb B is R0,78
(Monthly cost for Bulb A = 100W x 120 hrs x R1.30 ÷ 1000= R15.60
Monthly cost for Bulb B = 5W x 120 hrs x R1.30 ÷ 1000= R0.78)

53. Consider the diagram of the Solar system below. The correct ascending order of distance of the planets from the Sun is …



C. Mars, Earth, Saturn, Jupiter

54. The minimum thickness of a plastic shopping bag which complies with legal standards in South Africa is …

D. 80 micron

55. Which one of the following types of pollution can cause an outbreak of cholera?

B. Water pollution

56. Rhino horn consists of…

B. the same type of protein that makes up hair.

57. When you inhale (breath in), your ribs move …

A. inwards.

58. Bread is a(n) …

B. energy giving food. (Bread contains starch which give us the energy to keep going each day)

59. Tiny pores on the surface of leaves are called …

B. stomata. (Stomata are pores found in the epidermis of leaves. Stomata are responsible for the facilitation of gaseous exchange.)

60. How many bones are there in an average person's body at birth?

C. 270

61. Which one of the following environmental problems is not related to the combustion of fossil fuels?

C. Nuclear radiation (Nuclear radiation is a product of nuclear fusion reactions)

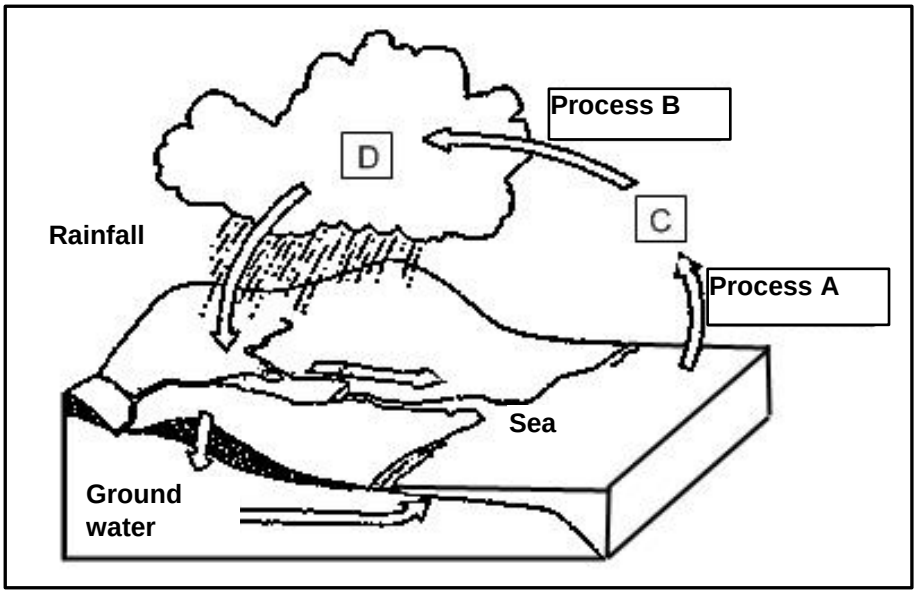
62. Which of the following is not a physical property of matter?

D. Flammability (Flammability is a chemical property of matter)

63. Bread placed out on a fire turns brown then black if left for too long on the fire. What is needed for this chemical change to take place?

A. Heat energy needs to be added. (Endothermic reaction – The reaction needs energy, in this case heat energy, to take place.)

64. Consider the following labelled diagram of the water cycle:



Choose the correct statement.

C. Process A is evaporation, process B is condensation and D is a cloud.

65. What form of energy is a lightning?

B. Electrical energy (Lightning can pack up to 5 billion joules of electrical energy per single strike)

66. Energy cannot be …

D. created or destroyed

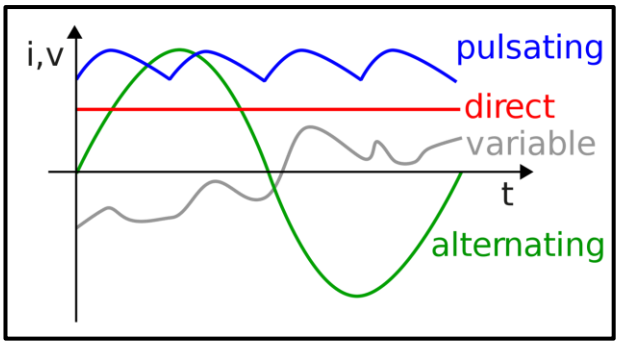
67. Where is the largest solar farm located in South Africa?

C. Northern Cape province (The Largest Solar Farm in SA is located near De Aar in the Northern Cape. It is able to produce 175 MW of electrical energy)

68. In a … circuit, all bulbs will switch off when one bulb goes out.

B. series

69. Use the information in the diagram and choose the type of electrical current generated at a power station.



A. Alternating current

70. Which one of the following is NOT required for photosynthesis to take place?

B. Oxygen (Oxygen is a product of photosynthesis)

71. A student observes how an ice cube melt into water. Has a chemical reaction taken placed during this process?

D. No, because no new substances have formed.

72. A student measures the mass of an ice cube and then allows it to melt. What do you think the mass of water will be after all the ice has melted completely?

C. The same as that of the ice. (Matter was not added or taken away, therefore the mass will remain the same.)

73. What can a physical property of a substance tell you about the substance?

D. A and B are correct.

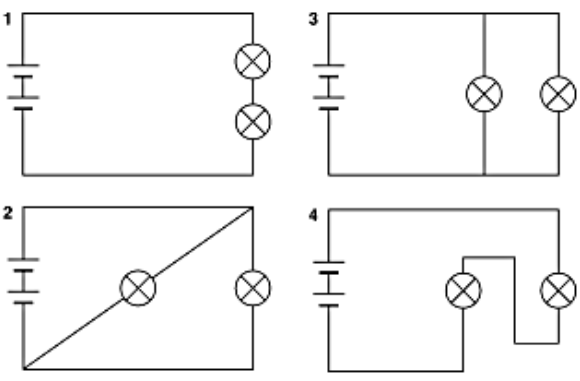
74. Why is the food we eat nearly always cooked?

C. Cooking food causes chemical and physical changes in food.

75. Which one of the following is proof that ice undergoes a physical change when left outside at room temperature?

B. Ice changes to water.

76. Consider the circuit diagrams below. The circuits that have two bulbs connected in parallel are ...



C. Circuit 2 and circuit 3 (The current split up into two branches in both circuits 2 and 3 – Parallel circuits. In 1 and 4, all the current passes through all the components – Series circuits)

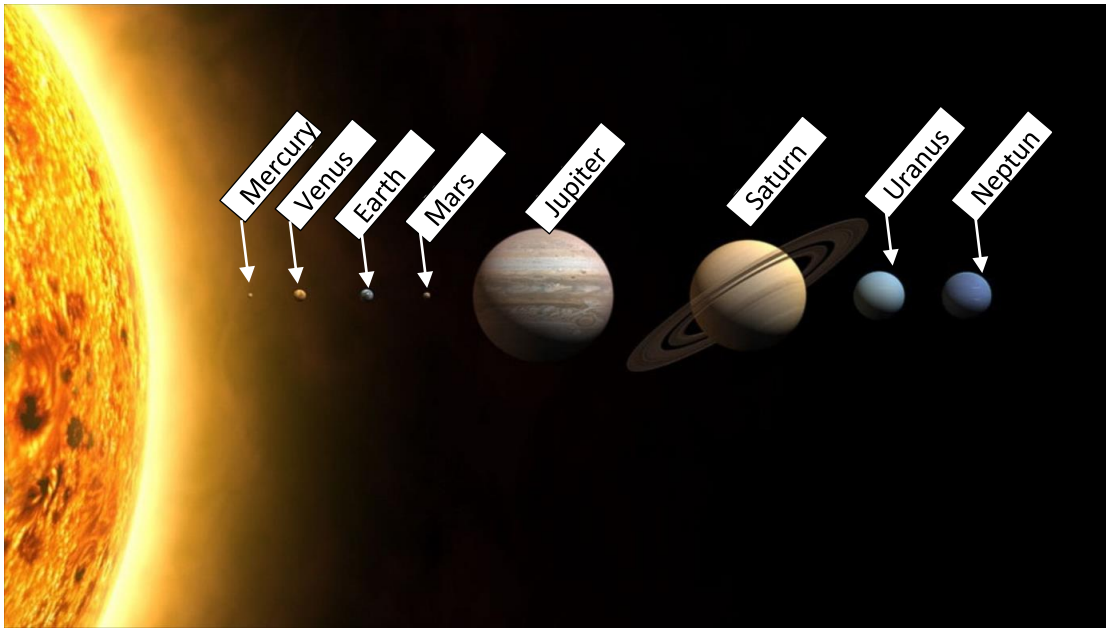
77. As water warms up, it …

B. expands. (Heat increases the kinetic energy of the water, which makes them to move further away from one another)

78. A vehicle running on petrol converts chemical energy, which is stored in petrol, to kinetic energy which in turn is responsible for the motion of the vehicle. More or less what percentage of chemical energy is converted to useful kinetic energy in a vehicle using petrol as fuel?

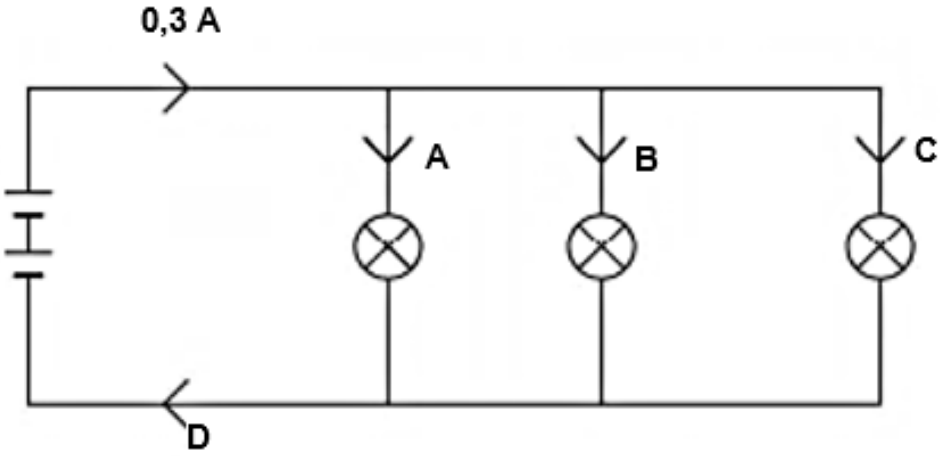
A. 20% (The remaining energy is converted to other forms e.g. heat and sound which is not useful in this case.)

79. Consider the picture of our Solar system and choose the correct statement.



C. The Earth is primarily made up of four elements, namely, iron, magnesium, silicon and oxygen.

Study the diagram below and answer QUESTIONS 80 AND 81: You can assume that all the bulbs in the circuit diagram are identical.



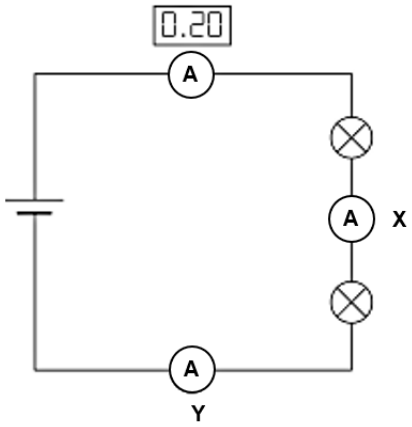
80. Choose the position in the circuit where the current will be 0,1 A.

C. At A and at B and at C.
(0,3 A will be divided equally into three branches A, B and C with 0,1 A passing through each branch A, B and C)

81. What will happen to the current flowing through bulb B and the brightness of bulb A if bulb C burns out?

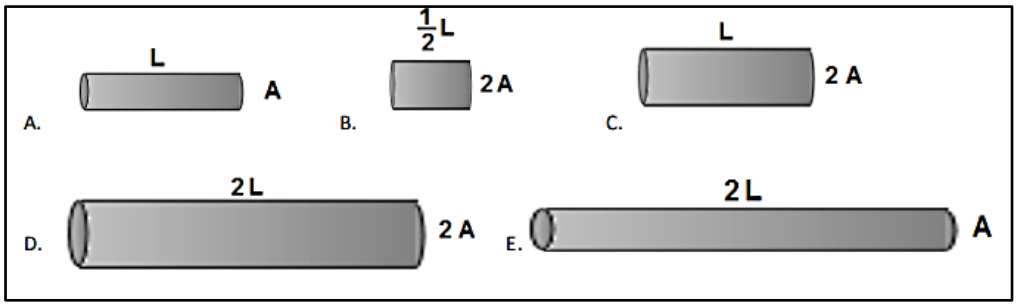
A. The current flowing through bulb B will remain the same.
The brightness of bulb A will remain the same.
(When C burns out, the total resistance of the circuit will increase, therefore The total current will decrease. The total current will, however now be divided into 2 branches instead of 3. The current and the brightness in the two remaining bulbs A and B will therefore remain the same as before C blew out)

82. Consider the circuit diagram below: What will the readings on ammeter X and Y be?



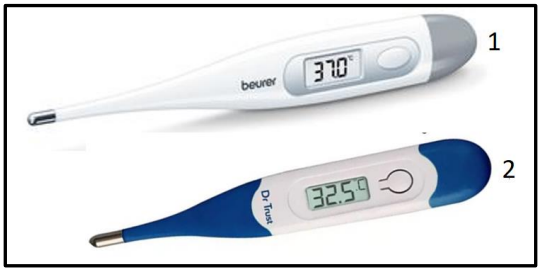
C. X = 0.20 A; Y = 0.20 A
(In a series circuit, the current is the same at all positions)

83. All the wires in the diagram below are made of the same material but are of different sizes. The length of the different wires is expressed in terms of L and the thickness of the wires is expressed in terms of A. Identify the wire through which electrical current will flow the easiest?



B. Wire B (B is the shortest and thickest – therefore has the lowest resistance)

84. Consider thermometer readings in the figure below and choose the correct statement



A. The reading on Thermometer 1 indicates a normal human body temperature. (Normal body temperature ranges between 36 °C to 38 °C)

85. The diagram below indicates teeth covered with tartar and that of clean teeth. What can be used to remove tartar easily?

C. High pitched sound waves. (sound is used to resonate tarter and break it into pieces that are dislodged from the teeth

86. A cloud that touches the earth is called ….

B. fog.

87. Which one of the following observations proves that a candle undergoes chemical changes while burning?

A. Black smoke (ash) is given off.

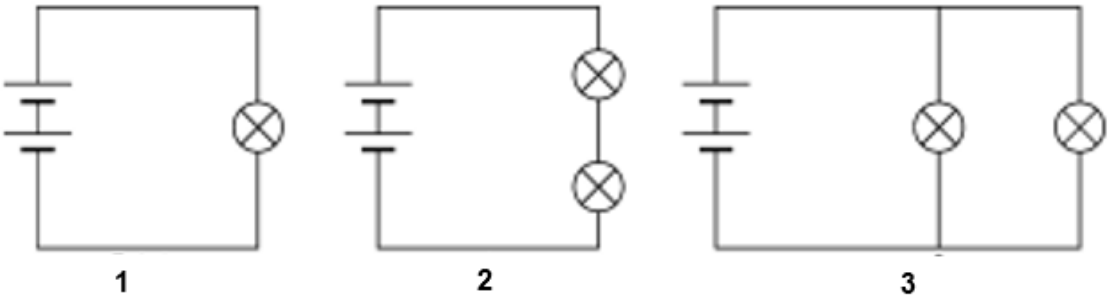
88. Which one of the following observations proves that a candle undergoes physical changes while burning?

B. The candle wax starts to melt.

89. Peter measures 1kg of water, pours it into a container and seals it with a lid. He then puts the container in a freezer. A day later he takes the container out of the freezer and notices the container has expanded (increased in size).
Peter then removes the ice from the container. What is the weight of this frozen block of ice?

C. 10 N
(Weight is measured in Newton. The weight of the water and that of the ice can be determined as follows: Weight = 1kg x 10m/s^2 = 10N)

Consider the following circuit diagrams and answer questions 90 and 91. You can assume that all the bulbs in the circuit diagrams are identical.



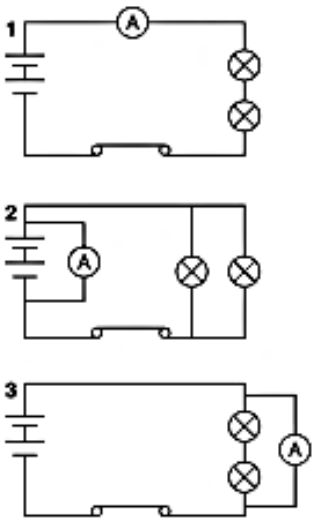
90. The brightness of the bulbs in circuits 2 and 3 would be as follows:

C. Circuit 2 = dim; circuit 3 = bright
(Circuit 2 has a higher total resistance, therefore lower current passes through the bulbs)

92. The bulb in circuit 1 would shine …

D. with the same brightness as any one of the bulbs in circuit 3.
(The total resistance of circuit 3 is halve of that of circuit 1, therefore the total current in circuit 3 is twice as large as the current in circuit 1. The total current in circuit 3 is however divided into two equal branches – therefore each branch receives the same current as the total current in circuit 1)

93. Consider the circuit diagrams below. The circuit in which the ammeter is connected correctly is …



A. Circuit 1 only
(The ammeter is connected in series in circuit 1)

Use the information in the diagram below and answer questions 94 and 95.

Sandstone **Granite**

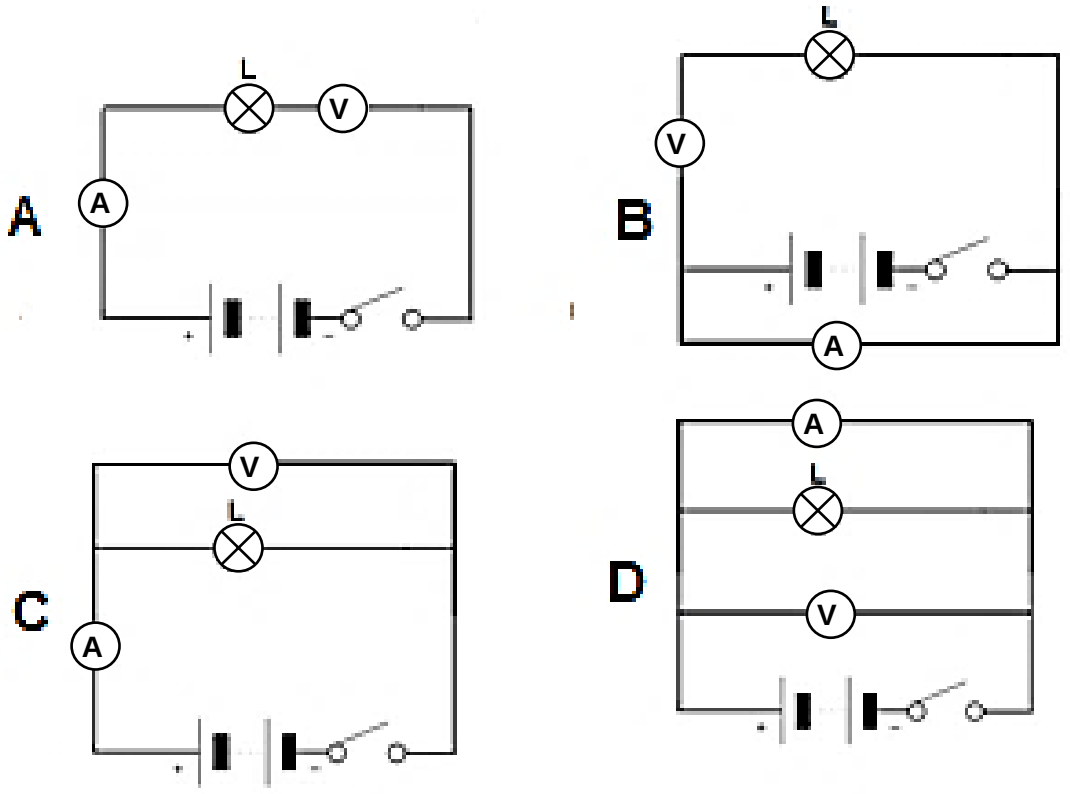
94. Which one of the following statements is TRUE?

B. Rock X can contain fossils while no fossils can be found in rock Y.
(Rock X is a sedimentary rock because it has layers and fossils are mainly found in sedimentary rock.)

95. Of which types of rock are X and Y examples of?

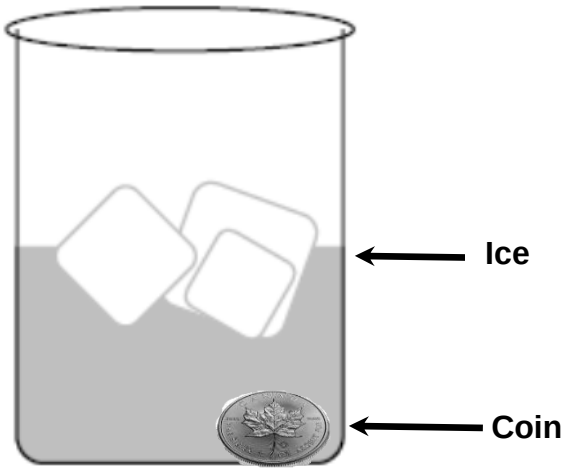
	X	Y
D	Sedimentary	Igneous

96. A group of learners performs an experiment on the topic electricity. Which of the following circuits can be used to measure the total electric current and potential difference needed to calculate the resistance of the bulb (L)?



C. Circuit C
(The ammeter is connected in series and voltmeter in parallel)

97. It is observed that a coin put in a glass beaker filled with water sinks to the bottom of the beaker. Ice cubes, which are much bigger and much heavier than the coin floats when put in the beaker.



Choose the correct explanation for this observation.

C. Ice floats on water because it is less dense than water.
(Ice is less dense than water, therefore floats on water. A coin is denser than water, therefore sinks in water.)

98. The ice cubes in question 97 will float higher in the water if one of the following changes is made.

D. Dissolve a few tablespoons of salt in the water before placing the ice cubes in the water.
(A saltwater solution has a higher density than normal fresh water. The difference in density between ice and saltwater is higher than between ice and fresh water. The ice will therefore float higher in saltwater.)

99. What is the length of the equatorial diameter of the Earth?

B. 12 756 kilometers

100. Which planet has no surface for spacecraft to land on?

D. Jupiter
(Jupiter is a gas planet without a hard surface where spacecraft can land on.)
